Adam Equipment

CBK SERIES

Service Manual

Software Rev.: 4.28 & above

4.25H & above for CBK 8H/16aH

ADAM EQUIPMENT CO. LTD.
P.N. 8735, Rev. A3, August 2007

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1.0 INTRODUCTION

- The **CBK** range of scales provides an accurate, fast and versatile general purpose weighing scales with parts counting, percent weighing and check-weighing functions.

- There are two series within the range. The **CBKa** series are similar to the **CBK** series except the **CBKa** scales can operate in both imperial and metric weighing units, whereas for the **CBK** series the imperial units are not available.

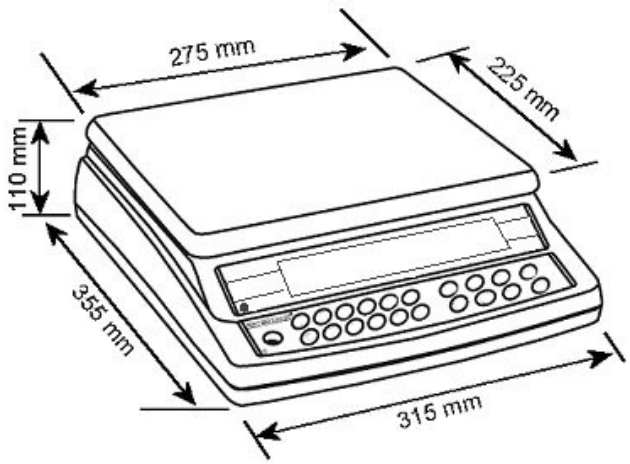
- All models have LEDs to indicate when a weight is below the low limit, between the limits or above the high limit next to the display. These can work in conjunction with an audible alarm for check weighing as well as LCD showing LO, OK and HI.

- All scales have stainless steel weighing platforms on an ABS base assembly.

- They are supplied with a RS-232 bi-directional interface and real time clock (RTC).

- The scales have sealed keypads with colour coded membrane switches and a large easy to read liquid crystal type display (LCD) supplied with a backlight.

- They include automatic zero tracking, semi-automatic & pre-set tare, accumulation facility that allows the weight to be stored and recalled as an accumulated total.



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2.0 SPECIFICATIONS

	CBK 4	CBK 8H	CBK 8	CBK 16	CBK 32	CBK 48
Kilograms						
Maximum Capacity	4 kg	8 kg	8 kg	16 kg	32 kg	48 kg
Tare Range	-4 kg	-8 kg	-8 kg	-9.9995 kg	-32 kg	-48 kg
Readability	0.0001 kg	0.0001 kg	0.0002 kg	0.0005 kg	0.001 kg	0.002 kg
Repeatability (S.D.)	0.0001 kg	0.0001 kg	0.0002 kg	0.0005 kg	0.001 kg	0.002 kg
Linearity (±)	0.0002 kg	0.0002 kg	0.0004 kg	0.001 kg	0.002 kg	0.004 kg
Grams						
Maximum Capacity	4000 g	8000 g	8000 g	16000 g	32000 g	48000 g
Tare Range	-4000 g	-8000 g	-8000 g	-9999.5 g	-32000 g	-48000 g
Readability	0.1 g	0.1 g	0.2 g	0.5 g	1 g	2 g
Repeatability (S.D.)	0.1 g	0.1 g	0.2 g	0.5 g	1 g	2 g
Linearity (±)	0.2 g	0.2 g	0.4 g	1 g	2 g	4 g

CBKa Series (USA models)

	CBK 8a	CBK 16aH	CBK 16a	CBK 35a	CBK 70a	CBK 100a
Pounds						
Maximum Capacity	8 lb	16 lb	16 lb	35 lb	70 lb	100 lb
Tare Range	-8 lb	-9.9995 lb	-9.9995 lb	-35 lb	-70 lb	-99 lb
Readability	0.0002 lb	0.0002 lb	0.0005 lb	0.001 lb	0.002 lb	0.005 lb
Repeatability (S.D.)	0.0002 lb	0.0002 lb	0.0005 lb	0.001 lb	0.002 lb	0.005 lb
Linearity (±)	0.0004 lb	0.0004 lb	0.001 lb	0.002 lb	0.004 lb	0.01 lb
Ounces						
Maximum Capacity	128 oz	256 oz	256 oz	560 oz	1120 oz	1600 oz
Readability	0.005 oz	0.005 oz	0.01 oz	0.02 oz	0.05 oz	0.1 oz
Repeatability (S.D.)	0.005 oz	0.005 oz	0.01 oz	0.02 oz	0.05 oz	0.1 oz
Linearity (±)	0.01 oz	0.01 oz	0.02 oz	0.04 oz	0.1 oz	0.2 oz
Pounds:Ounces						
Maximum Capacity	8 lb: 0.0 oz	16 lb: 0.0 oz	16 lb: 0.0 oz	35 lb: 0.0 oz	70 lb: 0.0 oz	99 lb: 15.9 oz
Display shows	8:_16.00	16:_16.0	16:_16.0	35:_16.0	70:_16.0	99:_16.0
Readability	0.01 oz	0.1 oz	0.1 oz	0.1 oz	0.1 oz	0.1 oz
Repeatability (S.D.)	0.01 oz	0.1 oz	0.1 oz	0.1 oz	0.1 oz	0.1 oz
Linearity (±)	0.02 oz	0.2 oz	0.2 oz	0.2 oz	0.2 oz	0.2 oz

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Kilograms						
Maximum Capacity	4 kg	8 kg	8 kg	16 kg	32 kg	48 kg
Readability	0.0001 kg	0.0001 kg	0.0002 kg	0.0005 kg	0.001 kg	0.002 kg
Repeatability (S.D.)	0.0001 kg	0.0001 kg	0.0002 kg	0.0005 kg	0.001 kg	0.002 kg
Linearity (±)	0.0002 kg	0.0002 kg	0.0004 kg	0.001 kg	0.002 kg	0.004 kg
Grams						
Maximum Capacity	4000 g	8000 g	8000 g	16000 g	32000 g	48000 g
Readability	0.1 g	0.1 g	0.2 g	0.5 g	1 g	2 g
Repeatability (S.D.)	0.1 g	0.1 g	0.2 g	0.5 g	1 g	2 g
Linearity (±)	0.2 g	0.2 g	0.4 g	1 g	2 g	4 g

OTHER SPECIFICATIONS

Units of measure	**CBK** Series- kg, g **CBKa** Series- kg, g, lb, oz, lb:oz
Interface	RS-232 bi-directional Interface
Stabilisation Time	2 Seconds typical
Operating Temperature	-10°C to 40°C 14°F to 104°F
Power supply	230 VAC 50/60 Hz 115 VAC available
Battery	Internal rechargeable battery (~90 hours operation)
Calibration	Automatic External
Display	6 digits LCD digital display with capacity tracker and symbols for units
Scale Housing	ABS Plastic, Stainless Steel platform
Pan Size	225 x 275 mm 8.9” x 10.8”
Overall Dimensions (wxdxh)	315 x 355 x 110 mm 12.4” x 14” x 4.3”
Net Weight	4.1 kg 9 lb
Applications	Weighing Scales
Functions	Weighing, Parts counting, % weighing, Check weighing, Check counting, Accumulation of weights
Date/Time	Real Time Clock (RTC), To print date and time information- battery backed

*** For USA models, ”lb” is always enabled when the power is turned on and are calibrated in “lb” unit**.

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3.0 TROUBLESHOOTING

PROBLEM	**POSSIBLE CAUSE**
Display is blank No turn on test	Power Switch faulty or not connected Battery not charged or faulty Power supply faulty or incorrect type
"- - - - - -"appears on display	Maximum capacity exceeded Load Cell damaged Electronics is faulty
Display is unstable	Drafts or air currents Obstruction under pan Sample is moving (animal weighing) Vibrations through table Temperature changed dramatically Electronics faulty or Battery low
Weight value incorrect	Calibration error, Recalibrate Unit calibrated with inaccurate weight Balance not level Obstruction between sample pan Wrong unit of weight displayed
Cannot use Full Capacity	Over-load Stops hitting pan support or hitting bottom of load cell Electronics faulty Parameters set incorrectly Load Cell Damaged
Not Linear	Overload stops hitting too soon Faulty factory calibration

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Off Centre Loading error	Overload Stops not correct Obstruction under pan
Battery will not charge	Charging circuit failure Battery Failure Incorrect adapter (below 800 mA) Processor failure

4.0 ERROR CODES

ERROR CODE	DESCRIPTION	POSSIBLE CAUSES
Err 1	Time input Error	Invalid time entry such as "268970" for the time format "**H-m-S**".
Err 2	Date input Error	34th day of a month is an invalid entry.
Err 4	Initial Zero is greater than allowed (4% of maximum capacity) when power is turned on or when the **[Zero/Enter]** key is pressed.	Weight on the pan when turning the scale on. Excessive weight on the pan when zeroing the scale. Platform is not installed. Improper calibration of the scale. Damaged load cell. Damaged Electronics.
Err 6	A/D count is not correct when turning the scale on.	Load cell is damaged. Electronics is damaged.
Err 7	Percent input error	Percent function is entered with no reference mass on the pan.
Err 8	High limit input error	Low limit is set first, then the high limit is set lower than the low limit and high limit not equal to zero.
Err 9	Low limit input error	High limit is set first, then the low limit is set higher than the high limit and low limit not equal to zero.
FAIL H or **FAIL L**	Calibration error	Improper calibration (should be within ±10% of the factory calibration). The old calibration data will be retained until the calibration process is complete.

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5.0 CBK DESCRIPTION

The CBK scales have an enclosure with all components mounted within it. To gain access to the components remove the 5 screws securing the cover to the base.

The basic unit consists of:

- ✓ Base
- ✓ Load Cell frame
- ✓ Power switch
- ✓ Main PCB assembly
- ✓ Battery
- ✓ Display PCB assembly
- ✓ Keypad

All models of CBK are similar except the selection of load cells and the program.

Normally if a problem is found with a circuit board the most cost effective method of solving the problem is to replace the circuit board.

The main PCB assembly includes:

- ✓ A/D converter (AU1),
- ✓ Microprocessor (DU1) and
- ✓ Power supply/battery charger circuits (DU5, T2).

NOTE: The wiring instruction for the transformer-

Input Voltage	Wires
230 VAC, 50/60 Hz	Red & Yellow
115 VAC, 50/60 Hz	Blue & Yellow

6.0 LOAD CELL DAMAGE

The most common reason a scale fails is that the load cell has been damaged. The damage can be from 2 primary causes. The first is physical damage due to an overload or an impact from the side and the second is damage due to the environment, such as moisture, extreme heat or a cut cable if the cables are exposed.

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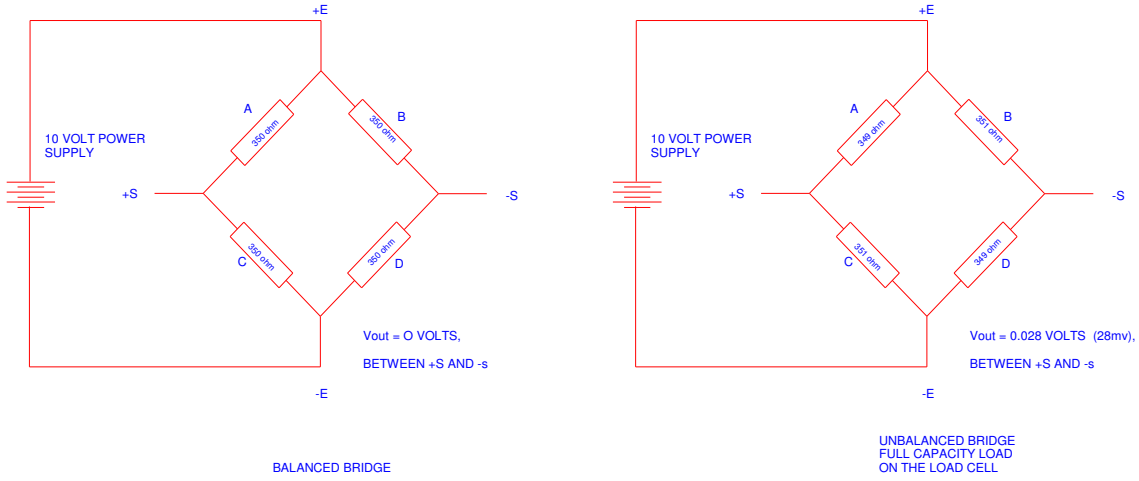
PRINCIPLE OF OPERATION

The stain gauge load cell is a method of measuring the amount of stress put onto a metal structure due to a weight being supported by the structure. The stress is measured using 4 strain gage sensors mounted in a particular way on the metal structure.

These 4 strain gauges are connected in such a way that they form a wheatstone bridge. See figure below. In the simplest load cells there are only the 4 resistances of the strain gages to consider. Normally without a load on the load cell all the resistances are the same. However when the load cell has a weight on it 2 of the strain gages will be in compression (A and D) and the resistance will decrease and 2 will be in tension (B and C) and their resistance will increase.



This will cause the bridge to become unbalanced. When the bridge has a voltage across it from +E to -E then the signal output at +S and -S will show a voltage of zero volts with no load and a small voltage proportional to the load as the load is increased. Typical load cells show 20-30mv of signal if the excitation voltage is 10volts and the load cell is fully loaded.

Most load cells used in scales are not as simple as this example. They have additional resistance elements added to compensate for temperature variations and to set the outputs to correct voltages. The circuit of a typical load cell is shown below-

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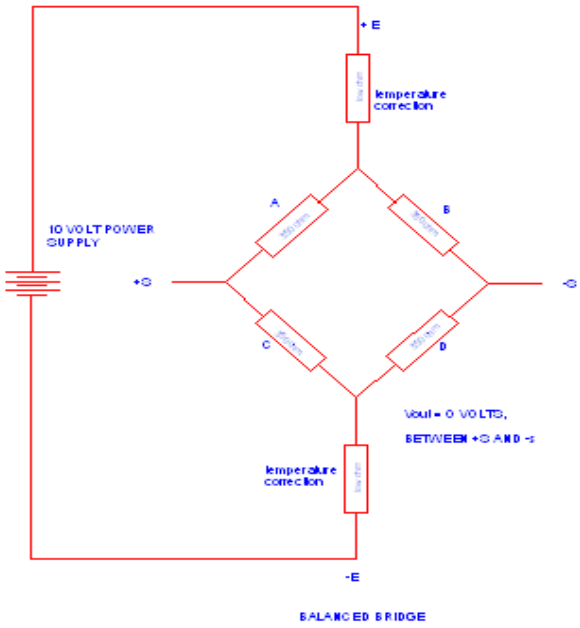

A method to check the basic function and integrity of a load cell can be done using a ohmmeter and voltmeter with up to a 10volt power supply.

Before the load cell is connected to the power supply use the ohmmeter to measure the resistance between the wires. Typical resistance values are:

+E to -E	410 ohms ±30 ohms
+S to -S	350 ohms ± 2 ohms

+E to +S or any other combination similar approximately 270 ohms.

If the load cell has Sense connections in addition they are connected to the excitation internal to the load cell.

Connect the load cell +E and -E to a power supply, typically 10 volts. Never use more than 12 volts as it may damage the load cell.
Measure the voltage between +S and -S.

With no load the voltage should be approximate 0mv ±3mv.

With a mass on the load cell the output voltage should increase. The amount by which it increases will be dependent upon the sensitivity of the load cell, capacity of the load cell, the excitation voltage and the amount of mass placed on the load cell. Most load cells have a sensitivity of either 2mv/V or 3mv/V.

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The expected change to the output is:

$$Vout = \frac{(2mv/V) * Vext * Mass}{\text{capacity of load cell}}$$

For example a 2mv/V load cell of 30Kg capacity with 20Kg placed on it. Vext is 5 volts would give a output of approximately:

$$Vout = \frac{(2mv/V) * Vext * Mass}{\text{capacity of load cell}} = \frac{2mv/V * 5V * 20Kg}{30kg} = 6.7mv$$

If the load cell has been damaged the no load voltage will likely be greater than 3mv or the loaded voltage will be grossly different from the expected value. Remember the loaded voltage will be offset by the amount of zero load voltage measured.

The load cell can be tested while it is connected to the A/D converter circuit board, using the scale power supply for excitation voltage.

TESTING LOAD CELLS IN THE SCALE

The signal from the load cells is amplified by the circuits on the A/D circuit board. The signal needs to be amplified to make it acceptable for the A/D converter used. The CBK-M scales amplify the input by 200 and change the no load voltage to about +2.5V. The amplified and offset voltage is measured at pin 6 of IC7, the INA118P amplifier IC. This voltage is sent to the filter and then to the A/D converter.

7.0 FACTORY PARAMETERS

The factory parameters are used for setting the capacity and basic settings.

Switch off the scale and then switch on again. Press **[Tare]** during the initial self-test.

The display will ask for a code number, "**P _ _ _ _** ".

Enter the number 2006 and press **[Tare].**

The display will show the first parameter "**F1 CAL**". To scroll through other parameters press the **[Func]** key.

The display will show the parameter number then the word describing the function.

Press the **[Tare]** key to enter a parameter.

Press the **[Zero]** key to exit a parameter. Pressing **[Zero]** again will return the scale to weighing.

When a parameter is entered by pressing the **[Tare]** key, the display will guide you through the parameter selected and the options available.

The parameters available are:

F1	**CAL**	To enter the Calibration
F2	**rES**	Resolution selection, not valid for approved units
F3	**CAP**	Select Capacity
F4	**int**	Initial Zero Range
F5	**rE Z**	Re-Zero Range
F6	**SCS**	Successive Tare Enable
F7	**Cnt**	Display the A/D counts
F8	**ZE M**	Set zero method
F9	**Ld M**	Set low voltage detect mode

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7.1 F1 -CALIBRATION

To enter the calibration parameter, press the **[Tare]** key when "**F1 CAL**" is displayed.

The display will instruct you to remove any weight from the scale, "**UnloAd**". Press **[Tare]**.
NOTE: USA models are calibrated using "lb" unit.

The display will tell you to add the first weight to the scale: "**Ld 1 00 kg**"

Place the first calibration weight as suggested in the Table below. Wait for stability then press the **[Tare]** key.

The display will tell you to add the second weight to the scale: "**Ld 2 00 kg**"

Place the second calibration weight as suggested in the Table below. Wait for stability then press the **[Tare]** key.

The display will show "**PASS**" if the calibration is OK. Or it will show "**FAIL L**" if calibration could not be completed correctly.

Remove the calibration weight. The scale will return to weighing.

Suggested Calibration Weights:

Models	Calibration weight 1	Calibration Weight 2
CBK 4 / CBK 8a	2 kg / 2 lb	4 kg / 5 lb
CBK 8 / CBK 16a	4 kg / 5 lb	7 kg / 10 lb
CBK 16 / CBK 35a	5 kg / 10 lb	15 kg / 30 lb
CBK 32 / CBK 70a	10 kg / 20 lb	30 kg / 50 lb
CBK 48 / CBK 100a	20 kg / 40 lb	40 kg / 70 lb

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7.2 F2 -RESOLUTION

NOTE: This value can not be changed for the CBK scales.

7.3 F3 – CAPACITY

To enter this parameter, press the **[Tare]** key when "**F3 CAP**" is shown.

The display will show the current capacity.

Press the **[Func]** key to scroll through the options.

Press **[Tare]** to accept the displayed value and return to the parameter or press the **[Zero]** key to return to the parameter without changing the value.

Then press **[Func]** to advance to the next parameter.

NOTE: The scale must be originally built for the capacity selected. The 4 kg unit uses the 5 kg load cells, 8 kg unit uses 10 kg load cells, the 16 kg unit uses 20 kg load cells, the 32 kg unit uses 35 kg load cells and the 48 kg unit uses 50 kg load cells.

7.4 F4 -INITIAL ZERO RANGE

To enter this parameter, press the **[Tare]** key when "**F4 int**" is shown.

The display will show the current initial zero range.

Press the **[Func]** key to scroll through the options.

Press **[Tare]** to accept the displayed value and return to the parameter or press the **[Zero]** key to return to the parameter without changing the value.

Then press **[Func]** to advance to the next parameter.

7.5 F5 -RE-ZERO RANGE

To enter this parameter, press the **[Tare]** key when "**F5 reZ**" is shown.

The display will show the current re-zero range.

Press the **[Func]** key to scroll through the options.

Press **[Tare]** to accept the displayed value and return to the parameter or press the **[Zero]** key to return to the parameter without changing the value.

Then press **[Func]** to advance to the next parameter.

7.6 F6 -SUCCESSIVE TARE

To enter this parameter, press the **[Tare]** key when "**F6 SCS**" is shown.

The display will show if the successive tare is "**tr on**" or "**tr oFF**".

Press the **[Func]** key to scroll through the options.

Press **[Tare]** to accept the displayed value and return to the parameter or press the **[Zero]** key to return to the parameter without changing the value.

Then press **[Func]** to advance to the next parameter.

7.7 F7 -A/D COUNT

To enter this parameter, press the **[Tare]** key when "**F7 Cnt**" is shown.

This parameter allows you to view the A/D counts from the internal A/D converter. This can be an aid to service.

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Press the **[Tare]** key to return to the PARAMETER menu.

Typical value at zero is 30,000-90,000 (approx.)
Typical value at full capacity is 500,000 (approx.)

7.8 F8 –ZERO

This parameter allows the normal method of setting zero.

To enter this parameter, press the **[Tare]** key when "**F8 ZE M**" is shown.

The display will show the current settings, "**modE 1**" or "**modE 2**".

Press the **[Func]** key to scroll through the options.

Press **[Tare]** to accept the displayed value and return to the parameter or press the **[Zero]** key to return to the parameter without changing the value.

Then press **[Func]** to advance to the next parameter.

7.9 F9 –LOW VOLTAGE DETECTION

This parameter allows detection of low voltage when the battery wears down.

To enter this parameter, press the **[Tare]** key when "**F9 Ld M**" is shown.

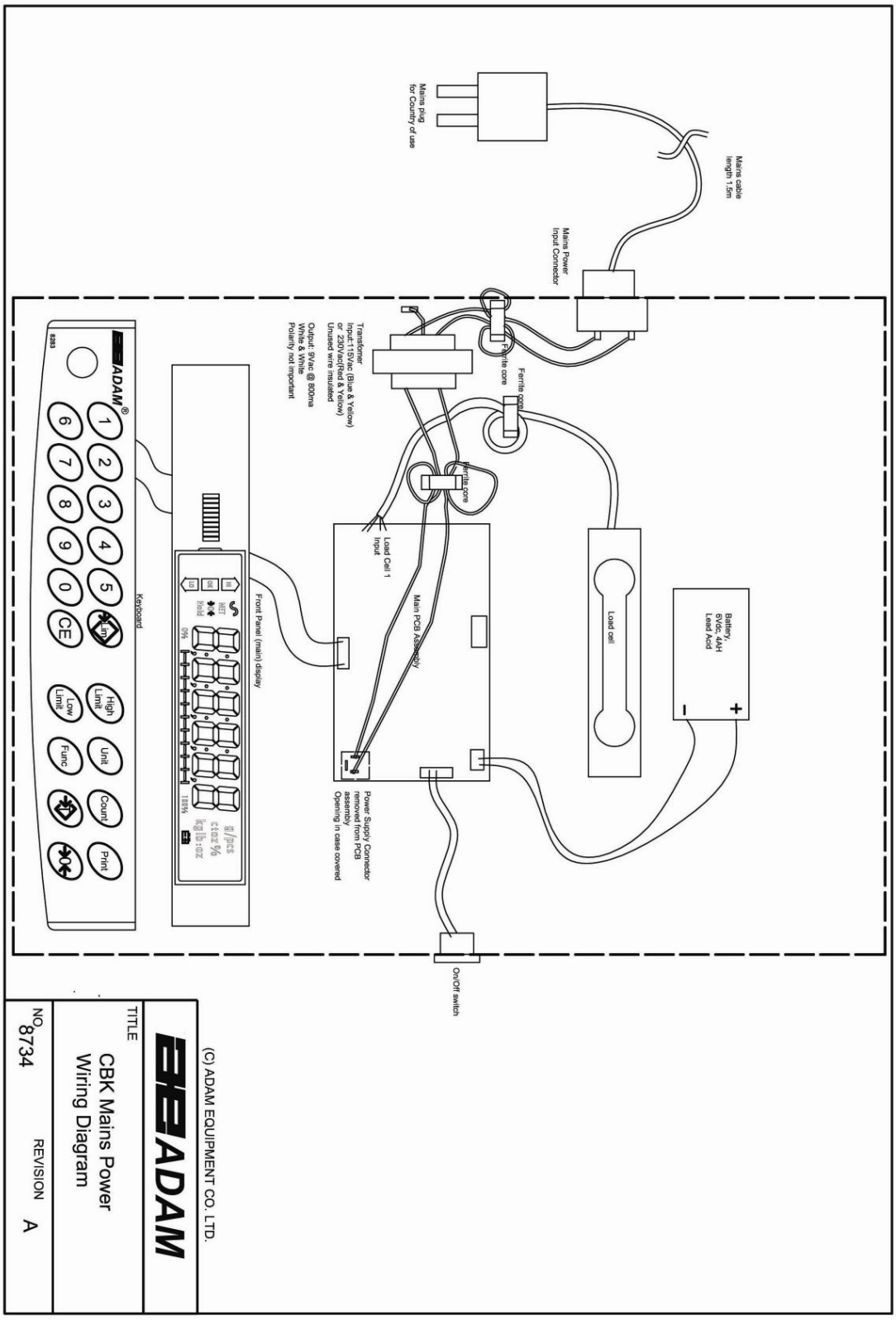
The display will show if the LVD Mode is set to **on** or **oFF**.

Press the **[Func]** key to scroll through the options.

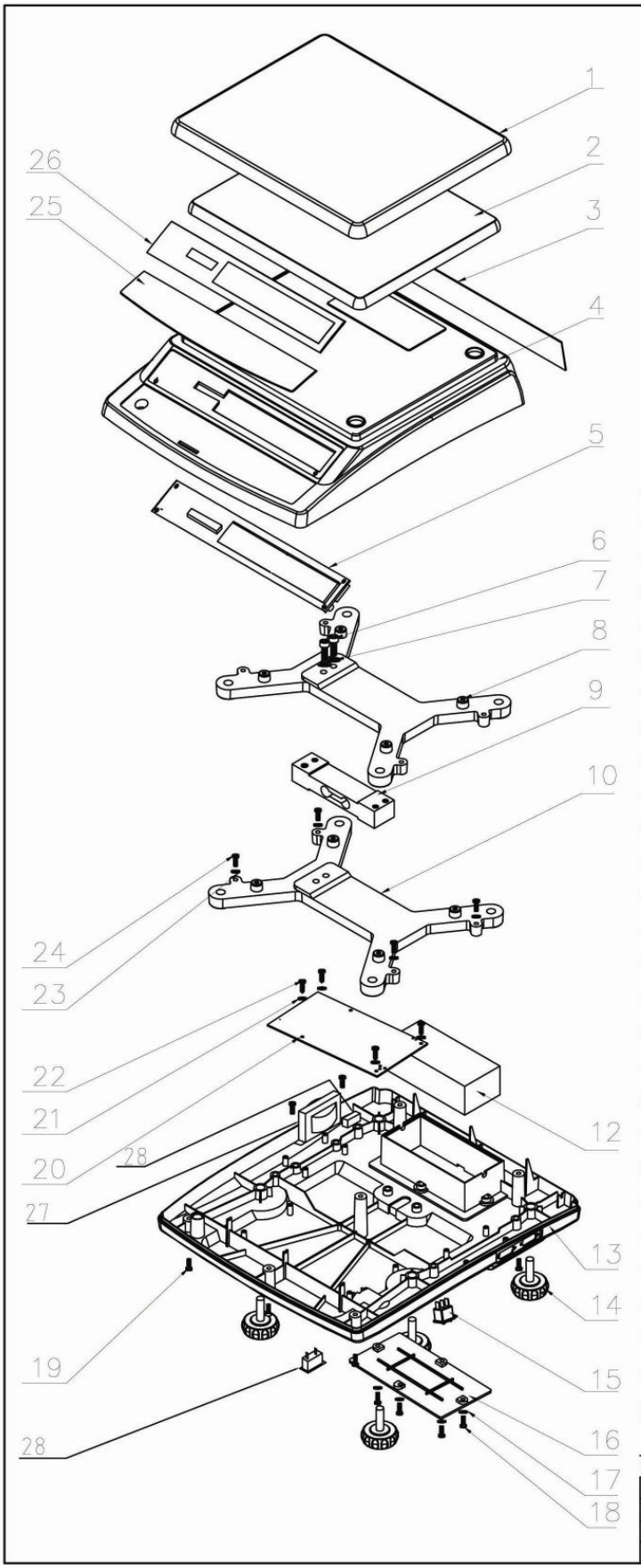
Press **[Tare]** to accept the displayed value and return to the parameter or press the **[Zero]** key to return to the parameter without changing the value.

Then press **[Func]** to advance to the first parameter.

8.0 WIRING DIAGRAM


Mains cable length 1.5m
Mains plug for Country of use
Mains Power Input Connector
Ferrite core
Ferrite core
Ferrite core
Transformer Input:115Vac (Blue & Yellow) or 230Vac(Red & Yellow) Unused wire insulated
Output: 9Vac @ 800ma White & White Polarity not important
Load Cell 1 Input
Main PCB Assembly
Load cell
Battery 6Vdc, 4AH Lead Acid
Power Supply Connector removed from PCB assembly Opening in case covered
On/Off switch
Front Panel (main) display
Keyboard
ADAM
(C) ADAM EQUIPMENT CO. LTD.
TITLE
CBK Mains Power Wiring Diagram
NO 8734
REVISION A

9.0 MECHANICAL ASSEMBLY



28	Mains input connector	1
27	Power Transformer	1
26	front display overlay	1
25	front keyboard	1
24	screw	1
23	washer	4
22	tapping screw	4
21	washer	4
20	main PCB Assy	1
19	screw	5
18	screw	1
17	washer	4
16	battery cover	1
15	power switch	1
14	support feet	4
13	bottom cover	1
12	rechargeable battery	1
10	the load cell lower supporter	1
9	the load cell	1
8	the load cell upper supporter	1
7	washer	2
6	screw	2
5	front display PCB Assy	1
4	upper cover	1
3	rear blank overlay	1
2	ABS pan	1
1	SST pan	1

PART.NO.	Name		COUNT
	Adam Equipment CO. LTD		
NAME CBK With Mains Power		Drawn by	
Scale		Approved	
Dwg No 8730		Date	04.01.27

CE

Manufacturer's Declaration of Conformity

This product has been manufactured in accordance with the harmonised European standards, following the provisions of the below stated directives:

Electro Magnetic Compatibility Directive 89/336/EEC

Low Voltage Directive 73/23/EEC

Adam Equipment Co. Ltd.
Bond Avenue, Denbigh East
Milton Keynes, MK1 1SW
United Kingdom

FCC COMPLIANCE

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. The equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Shielded interconnect cables must be employed with this equipment to insure compliance with the pertinent RF emission limits governing this device.

Changes or modifications not expressly approved by Adam Equipment could void the user's authority to operate the equipment.

WEEE COMPLIANCE

Any Electrical or Electronic Equipment (EEE) component or assembly of parts intended to be incorporated into EEE devices as defined by European Directive 2002/95/EEC must be recycled or disposed using techniques that do not introduce hazardous substances harmful to our health or the environment as listed in Directive 2002/95/EC or amending legislation. Battery disposal in Landfill Sites is more regulated since July 2002 by regulation 9 of the Landfill (England and Wales) Regulations 2002 and Hazardous Waste Regulations 2005. Battery recycling has become topical and the Waste Electrical and Electronic Equipment (WEEE) Regulations are set to impose targets for recycling.

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Adam products are predominantly designed for the Laboratory, Educational, Medical, retail and Industrial Segments. The product range can be described as follows:

-Analytical and Precision Balances
-Compact and Portable Balances
-High Capacity Balances
-Moisture analysers / balances
-Mechanical Scales
-Counting Scales
-Digital Weighing/Check-weighing Scales
-High performance Platform Scales
-Crane scales
-Medical Scales
-Retail Scales for Price computing

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